Synopsis

Growth and Technological Changes in Cement Industry

The growth and development of a country to a greater extent is achieved through industrialisation. Cement is one of the key sectors of the Indian economy, which received a prominent place ever since independence, due to its importance in building up of basic infrastructure for social development .The Indian cement industry has been widely known for undergoing rapid technological changes over the years since its inception.

The continuous transfer of technological process from the inefficient wet to efficient dry process is one of the greatest achievements of this industry, which makes it the second largest producer in the world. A plethora of studies available on the Indian cement industry concentrates on the issues like location, productivity, capacity utilization, costs, market structure and concentration, environmental issues, mergers and acquisitions, etc. Very few studies had been done with respect to technological changes and especially during the last decade. Hence this study is an attempt to fill the gap identified from the review of literature and focus on the economic analysis of technological changes of the Indian cement industry. Besides, the industry was totally decontrolled in 1989 succeeded by the deregulations of 1991. In this context, this study becomes more relevant as it tries to map the growth of the cement industry, its technological evolution, and the effects of this technological change on its development.

Objectives

1. To examine the economic and financial performance of the selected sample firms of the Indian cement industry during 2008-2009.
2. To assess the technical efficiency of the selected sample cement firms during 2008-2009.
3. To analyze the growth trends and pattern of the Indian cement industry.
4. To determine and analyze the trends in technology, and Research and Development, of the Indian cement industry.
5. To identify the problems and issues confronting the Indian cement industry.

Data and Methodology

A sample of thirteen cement firms were selected for the firm level analysis on the basis of sales in 2008-’09. The financial performances of these firms were analyzed under the broad financial ratios categorized as liquidity ratios, leverage ratios, activity ratios, profitability

ratios and growth ratios. The technical efficiency of the sample firms were evaluated using Data Envelopment Analysis.

The growth and trend analysis of the Indian cement industry is carried out for a period of 15 years from 1994-'95 to 2008-'09. The analyses of technological change were conducted using the productivity ratios and production functions. Productivity ratios were measured using Kendrick, Solow, and Translog indices. The production functions such as the Cobb-Douglas, Constant Elasticity of Substitution, and the Translog have also been estimated. An analysis on Research and Development expenditures as well as that of technology imports was also carried out. Apart from these, the trend and compound average growth rates of variables such as capacity, production, capacity utilisation, exports and consumption; the cost structure of the industry were also looked into. Along with the growth rates regression and correlation were used wherever relevant and appropriate.

The firm level analysis utilised the data from electronic database *Capitaline*, besides the information provided by the authorities of Cement Manufacturer's Association and firms. The data used for the industry level analysis is largely drawn from Centre for Monitoring Indian Economy's (CMIE) electronic database-*Prowess*. In addition, data from various publications of National Accounts Statistics, R.B.I Bulletins, and the various issues of Cement Statistics published by the Cement Manufacturer's Association, were also utilised. The data obtained from *Prowess* for the variables were expressed in nominal terms and therefore was deflated using appropriate price indices.

The conclusions that are inferred from the study are recapitulated in two sections: the firm level analysis, and the industry level analysis.

The Firm Level Analysis

The performance of the sample firms assessed from their cost structure showed that energy cost constitutes the greater amount in production followed by raw material cost, with an average of 33 and 29 percent respectively. On an average, the share of wages and salaries is 9 percent while that of depreciation is 8 percent. Other manufacturing expenses of these firms are higher than that of cost of employees and depreciation. In terms of higher cost per unit of output produced, the least efficient firm is Kesoram Industries Ltd. and the most efficient firm is JK Cements Ltd. The average capacity utilisation of the sample firms is 89 percent. It was also found that profit margin does not influence the investment pattern of these cement firms. The export as a percentage of sales is found to be highest for Ultra Tech Cement Ltd. (8.76) and least for Jaiprakash Associates Ltd. (0.08). Only eight firms engage in R&D

activities and they gain an edge over their competitors. The highest R&D intensity is for Madras Cements Ltd. with 93 percent.

The current ratios of all the firms except a few were high and were above the norm. The value of quick ratio for five firms is below unity representing a bad liquidity position. The amounts of borrowed funds are very low and were backed up by shareholder's equity. The interest coverage ratios for all the firms are above the minimum indicating their sufficient profit earnings to pay periodically the interest charges. Ultra Tech Cement Ltd. utilizes its current resources to a larger extent in generating its income when compared to other firms. The total asset utilization is high for ACC Ltd. The net profit margin is highest for Shree Cements Ltd. (21 percent), closely followed by ACC Ltd. (20 percent) indicating a satisfactory return on their investment. In terms of growth rates, Jaiprakash Associates Ltd. (45.6 percent) has the highest rate of growth of sales and the operating profit rate is highest for Shree Cements Ltd. (88.7 percent). The assets growth is largest for Kesoram Industries Ltd. (58.05 percent) and least for India Cements Ltd. (9.48 percent).

The Data Envelopment Analysis using CCR model showed an average technical efficiency score of 0.92 and 0.96 under BCC model. The average scale efficiency score is 96 percent. Five cement firms (ACC Ltd., Jaiprakash Associates Ltd., JK Cements Ltd., Century Textiles & Industries Ltd., and Kesoram Industries Ltd.) operates at most productive scale size; their technical efficiencies under both models (i.e. in CRS and VRS) and scale efficiencies are all equal to one; exhibits constant returns to scale and are the top firms in the sample. Of the remaining eight scale inefficient firms, four firms are exhibiting increasing returns to scale and another four firms showing decreasing returns to scale. The analysis reveals the dominance of two firms; ACC Ltd. and Jaiprakash Associates Ltd. used for reference by inefficient firms/DMUs. The results of DEA also provided the input slacks and input targets for the inefficient DMUs to make their improvements.

The Industry Level Analysis

The average annual growth rates of capacity, production, consumption, and capacity utilisation are 7.6, 8.2, 8.3, and 0.7 percent respectively. The average utilisation of capacity over the study period is 79 percent. In this industry, the installed capacity is rarely utilised to the full or the capacity is mostly under estimated as there is a huge difference between installed capacity and production. The presence of this excess capacity might have activated large-scale consolidation in the industry. Cement exports were gradually increasing and have grown at a CAGR of 8.33 percent.

On the whole, during the period of study, the trend rates of productivities of labor was decreasing and that of capital, energy and raw material was increasing slightly. The overall efficiency of the industry in terms of total factor productivity is found to be mildly increasing. Thus, TFP or technical change that captures the growth in output not accounted for by the growth in inputs is very low. The estimated Cobb-Douglas production function is found to be statistically significant at one percent significance level with high R^2 value of 96 percent. The efficiency parameter is found to be positive and the coefficient of time is 0.113, which indicates a mean technical progress of 11 percent per year. Elasticity of capital and material is found to be negative while that of labor and energy is positive. The sum of elasticities of input factors came up as 0.021, implying decreasing returns to scale. The Constant Elasticity of Substitution production function with two inputs capital and labor estimated using Kmenta's linear approximation method are statistically significant at 5 percent level; except for the intercept term and the time variable. The positive coefficient of time implies technological progression and the efficiency parameter is found to be highly positive. The return to scale parameter is estimated at 0.365, indicating diminishing returns. Elasticity of substitution between capital and labor slightly greater than unity (1.045), suggesting a greater possibility of labor substitution for capital. The translog production function using two inputs capital and labor, allowing for technological change found to be statistically significant with high R^2(0.96). It was found that the rate of technical change increases at an increasing rate through time. The coefficients of time interacted with capital is negative and is significant at 5 percent level, implying capital saving technical change. Regardless of the positive trend rate of growth (0.08) and CAGR (8.3 percent) in R&D expenditure, its increase is not as much as the rise in output, over the time. The industry is chiefly engaged in the imports of technology from abroad when compared to its R&D efforts. The cost-output elasticity obtained is significant and shows an inelastic value of 0.991. Economies of scale are found to be positive with a low magnitude of 0.009, implying the existence of local economies of scale in the industry.

The major problems of the industry are largely related to the sectors-Coal, Power, and Railways. The industry also confronts environmental, social and economic issues. The Indian cement industry should continue to adopt more pragmatic strategies that would further enhance productivity, efficiency and cost reduction.